PATENT SPECIFICATION

DRAWINGS ATTACHED

1,115,752

1,115,752

Date of Application and filing Complete Specification: 12 Oct., 1966.
No. 45674/66.
Application made in Japan (No. 56009) on 24 Aug., 1966.
Complete Specification Published: 29 May, 1968.

Index at acceptance: —B6 H(6B4, 6F3A, 6HX, 6J6, 6J7); B8 A1C4E3A

Int. Cl.: —B 65 h 33/12

COMPLETE SPECIFICATION

A Method of Automatic Stacking and Sorting of Newspaper or other Printed Material

We, HAMADA PRINTING PRESS MFG. CO., LTD., a body corporate organized under the laws of Japan, of 2—21, Naka, Mitejima, Nishi-Yodogawa-Ku, Osaka, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: —

This invention relates to a method for automatic sorting of newspapers and other printed matter, and an automatic control for use in said method.

The invention is characterized by an automatic control system to be used in the delivery of printed matter for the purpose of sorting the same in accordance with a program representing certain sorting items, said automatic control system comprising detecting the number of copies of newspaper or other printed matter being conveyed continuously in the course of conveyance at all times, causing memory means to memorize such sorting data as, for example, the destinations to which said newspaper or other printed matter is to be dispatched, the numbers of copies thereof by destination, and other information, sending the information so memorized to direction means, and controlling the digital detected information applicable to said printed matter being conveyed by means of the directions from said direction means through control means, thereby intercepting the conveyance of said printed matter. Another feature of the present invention is that the sorting information received by said direction means is forwarded to means adapted to control the sorting according to the destination descriptions to which the printed matter is to be ultimately delivered thereby controlling the sorting and delivery means responsible for stacking and delivery of said printed matter for shipment.

In case the printed matter is packaged and tied, a visual identification of the package is effected based on said direction means prior to the controlling of the sorting and delivery means. The above-mentioned control means controls the sorting and delivery operation of said means, thereby causing the sorted bundles of the newspaper or printed matter to select the proper shipping junctions disposed along said sorting and delivery means. In this manner, the bundles may be properly loaded into trucks or other vehicles through such shipping junctions in strict accordance with the program. In addition, a direction is also fed to the rotary or other printing machine through said direction means to ensure that the sorting and delivery rate at the above-mentioned delivery means of section coincides with the printing speed and, accordingly, to ensure that both the printing of newspaper or other printed matter and the sorting and delivery operation are carried out more efficiently on a rationalized basis.

As explained above, with printed card, punch card or other means containing programmed sorting items such as destinations, numbers of copies and other information being used as memory means, various controls are effected by direction means through the resulting memory, and after said controls, the used cards are utilized as sorting sheet or labels to be affixed to the surfaces of the corresponding bundles sorted out as above. In case a perforated tape or magnetic tape is employed instead of said cards, an address printing machine may be provided to make sorting sheets from said tape and the resulting sheets affixed to the bundles.

It also falls within the scope of the invention to cause a computer to memorize the

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programmed information and to carry out a centralized digital control between a plurality of stackers.

The newspaper or other printed matter fed out from a rotary or other printing machine is folded in two or four and, as such, is transported on a travelling conveyor in a continuous flow of individual sheets until they are finally loaded into trucks or other vehicles. Therefore, no matter how fast said newspaper or other printed matter is printed by said printing machine, the desired object of effecting a quick shipment of the printed matter will not be accomplished unless said printed matter is delivered and loaded into trucks or other vehicles at a rate commensurate with the printing speed. For this reason, it is a vital problem to find a means whereby the folded printed matter placed on a travelling conveyor in a flow of sheets may be quickly and accurately sorted, that is to say, may be quickly and accurately delivered to shipping junctures or platforms along the delivery means, said junctions having direct access to trucks or other transportation means. Prior to the shipment of the newspaper or other printed matter, such sorting operations as will be described below are required. They are: (1) sorting the printed matter into predetermined batch sizes, (2) sorting the same by the modes of sale, that is to say, sales through franchaised deals, on the newsstands, and the like, and (3) sorting the same by whether it is to be transported by truck or train, or by what route. If the newspaper or other printed matter is loaded into a truck or other vehicle, bypassing a sorting operation, there will be encountered much confusion when they are delivered, with the result that the delivery of newspaper or other printed matter itself becomes an inefficient job. It has been thought difficult both methodically and mechanistically to effect such sorting as described above and, based on such sorting, conveying printing matter quickly and accurately to transportation means, and we have never heard of an instance in which such a successful automatic sorting and delivery system as described above has been developed.

After years of research, we have succeeded in overcoming the difficulties which have heretofore been considered unsurmountable. Thus, the present invention is based on the premise that in order that the transportation of newspaper and other printed matter may be automatically controlled, it is imperative to introduce a series of automatic controls at the stages of sorting and delivery from the printing process.

An object of the present invention is to provide means which does easily, quickly and accurately sort the printed matter fed out by the printing machine onto a travelling conveyor system into bundles, each containing a predetermined number of copies and a predetermined group of copies.

Another object of the invention is to provide means whereby said bundles of newspaper or other printed matter are easily and quickly packaged and tied up.

Still another object is to sort printed matter by identification means according to a program containing such sorting information data items as the destination and number of copies of the printed matter to be shipped and others, and to deliver the sorted printed matter easily, quickly and accurately to predetermined shipping junctions along a sorting and delivery route so that the bundles may be quickly and accurately loaded into trucks and other vehicles in accordance with said program.

Yet another object is to prevent confusion in the shipping department by affixing a sorting sheet or label to each of the said bundles of newspaper or the other printed matter, for unless said bundles carry identification marks even if they have been properly sorted, there would be much confusion in the shipping department.

All told, the fundamental object of the present invention is to carry out the conveyance, sorting and shipment of newspaper or other printed matter automatically under a programmed control covering the entire movement of said printed matter from the printing machine to the truck or other transportation means. Although the following description particularly partains to the sorting and delivery of newspaper, the invention is by no means limited thereto, but may be applied to magazines and other printed matter.

In order that the invention may be more clearly understood, emobdiments thereof will now be described by way of example, reference being made to the accompanying drawings in which:—

Fig. 1 is a schematic diagram illustrating a preferred example of the automatic control system of this invention;

Fig. 2 is a block diagram showing the control system to be used in the control section shown in Fig. 1;

Fig. 3 is a partially exploded plan view showing the automatic control system of this invention, which represents the section from a stacker to shipping junctions to be provided in the course of a sorting and delivery system;

Fig. 4 is a side elevational view of said stacker;

Fig. 5 is a plan view of Fig. 4;

Fig. 6 is a side elevational view of a packaging machine to be used according to the invention;

Fig. 7 is a plan view of said packaging machine;

Fig. 8 is a sectional view of said packaging machine;

Fig. 9 is a partially exploded elemental

diagram showing the sorting and delivery section;

Fig. 10 is a diagram explaining the sequential memory patterns for a route from a cutting-in point to another or to a shipping junction on said delivery section with respect to the sequential memories for the x, y and z sections of Fig. 9;

Fig. 11 is a diagram explaining the shift registers adapted to advance the memorized information in synchronism with the movement of the conveying section conveyor;

Fig. 12 is a diagram explaining the sequential memory circuits 70, 70;

Fig. 13 is a diagram showing the memory circuits of Fig. 12, supplemented by another series of memory circuitry; and

Fig. 14 is a block diagram of the electrical system to be used in the method and apparatus of the present invention.

Referring, now, to Figs. 1 and 2, a stream of newspapers 2, in overlapped form, flows continuously on a conveying mechanism 1 and, a counting means 3 of the photoelectric cell type consisting of a projector and a light receiving element counts the number of copies of the newspaper being conveyed. Thus, the number of copies is detected based on the shadow formed by the overlapping of the folded-back edge of a paper and the leading edge of the immediately proceeding paper. Now, as the number so counted reaches a predetermined value, an intercepting solenoid 4 is actuated as will be explained hereinafter, whereupon a stop 5 intervenes into the stream of papers on the conveying mechanism 1 from the preceding stream which continues being sent into a delivery basket 6. The number of copies of the printed matter sent into the basket 6 in this manner has been determined according to the program which has been previously formulated. On the other hand, the destinations, the numbers of copies and other information items that are necessary for the shipment of newspapers are programmed onto punched or printed cards 7. These cards 7 are fed from a card sorter 8 through a card transfer part 9 equipped with a kicker and, in the course of travel, the information contained in each card is read by a card reader 10, the mechanism of which is conventional. Thereafter, the card 7 is placed on the uppermost paper 2 of the batch stacked up within said basket 6 through a card chute which may be conventional. In case said card is a perforated tape or a magnetic tape, the address and other information is printed on a separate sheet by an address printing machine 17 and the sheet is placed as above on the uppermost paper 2. Indicated by reference numeral 11 is a control establishing part adapted to obtain control values corresponding to the programmed sorting information, and 12 is a memory circuit. As explained above, the number of copies of the folded printed matter 2 being conveyed in overlapped form on the conveying mechanism 1 reaches a predetermined value, the flow is interrupted partway, with the preceding stream continuing to be conveyed into the basket 6, the required number of copies of the printed matter so sent into the basket 6 being obtained as the stop 5 is triggered by the intercepting solenoid 4. A preliminary stop 23 which is located rearwardly of said stop 5, is actuated by a solenoid which functions as follows. Thus, the program including the destination, the number of copies and other sorting information items required for shipment of the printed matter is read out by the photoelectric cell system, the brush system, or any other known read-out system through the utilization of the punched holes in the card or tape, or by means of other read-out system involving the use of a computer or another tape read-out system. The information read out in this manner is then memorized by said memory circuit 12.

While as shown in Fig. 14, this memorizing function is performed by the self-retention of a relay and other mechanism, the series of memories so produced is sent to the directing means, through which the abovementioned program is conveyed, as a direction, to the printed matter travelling in overlapped form on the conveying machine. Stated differently, this direction is given to the paper delivery system as control values which set off controlling of the delivery of the printed matter. Thus, in case the card system is employed, the card read-out means 10 reads out the information contained in the card in a program form, the said program being then memorized by the memory circuit 12. The memory is now conveyed as a control direction to the newspaper delivery system through a direction circuit 13. Then, the digital control direction is compared with the integrated number of copies of the printed matter detected by said detector 3 and when the two values are identical, the solenoid 24 and, accordingly, the preliminary intercepting stop 23 are actuated.

The batch of newspaper stacked up within the basket in a required number as described above is forwarded, by a conventional pusher mechanism, to a packaging machine 74 and bundling machine 14, by which the batch is packaged and bundled for delivery to a delivery mechanism 20. At this moment, the delivery signal from a batch size establishing section 15 and the reset signal from a bundle size establishing section 16 reset the memory circuit 12 so that, in case a card system is utilized, after the used card is fed out, the information contained in a fresh card is memorized to prepare for the next controlling function. When the tape system is used, an information newspaper sorting sheet is printed as above by means of an address

printing machine 17 and the resulting print is pasted by a sorting sheet pasting machine 18 onto a packed and bundled newspaper bundle which has been delivered out under the control of programmed direction and packaged and bundled by said packaging and bundling machines, respectively.

When a printed card or other card is used in place of the above-mentioned tape, the card which has been subjected to the above-mentioned control and is now useless is directly placed on the uppermost sheet of the newspaper stack within the basket 6 without passing through the printing machine 17. When the required number of sheets has been previously determined on a daily batch basis, the integrated control program may be recorded on a magnetic tape, for instance, and the directions issued by the magnetic tape may be transmitted by a master control system adapted to apportion the control information to the various delivery courses from the rotary printing machine to various delivery mechanisms 20. The control process of this invention may thus be carried out by activating the control and memory circuits for the various newspaper delivery courses arranged in parallel. Indicated by reference numeral 21 is a stacker. Since the control process of the invention is one that quickly and precisely performs a series of delivery, sorting and other functions, all automatically, the complicated sorting items which may daily change, such as the destination and number of copies of newspapers, whether a particular batch is to be sold on the newsstand or directly delivered to the subscribers, whether a batch is to be transported by train or truck, and other items, may be quickly and exactly processed. With such an efficient sorting of newspapers having been made possible, the great amounts of labour and floor space which have been indispenable are now reduced considerably. Furthermore, when two copies of said print card or punch card are produced, one of them may be placed, as a sorting sheet, on the uppermost sheet of the paper stack within the basket, while the other card may be used for recording the number of copies sold and other bookkeeping purposes, thereby facilitating office paperwork.

Referring to Figs. 3, 4 and 5, the stacker 21 has the following structure. Thus, the constant speed part 22 of the conveying mechanism 1 is equipped with a stop 5 as described above, and the preliminary intercepting stop 23 is located between said stop 5 and the detector 3 above the conveying mechanism 1. The two stoppers 5 and 23 are indirectly and electrically connected to the detector 3 through the direction circuit 13 adapted to issue directions based on the information memorized by memory circuit 12 adapted to read out the program. The stop 5 has a solenoid 4, while the stop 23 has a solenoid 24. Indicated by reference numeral 25 is a stacker control element which is connected to the direction circuit 13. A paper guide roll 27 is provided between the above-mentioned constant speed part 22 and a batch forming opening-closing plate 26. The opening-closing plate 26 consists of comb-shaped halves 28 and 29 which are disposed on downwardly inclined planes symmetrical with each other, with the rear edge of the half 28 facing the forward edge of the other half 29 through a small clearance. The above-mentioned halves are free to open and close between frames 30 and 31. Thus, the halves are permitted to freely slide along the mildly downwardly inclined planes. In addition, there is provided a paper dropping control element 33 which stands vertically along the rear edge of the half 29. A basket 34 is located just below the opening-closing plate 26. The basket 34 is capable of being rotated by an hydraulic system 35. The basket is also provided with a base plate 36 which has a required number of openings, through which are disposed the corresponding number of paper lifting rollers 37, which may move vertically through the aid of cylinders 38. At the four corners of the basket are disposed newspaper pressing plates 39 which are caused to open and close by cylinders 40. On the side of the basket opposite to the side on which the printed matter is pushed out, a paper bundle pusher plate 41 is located so that the bundle stacked up within the basket may be pushed out through the aid of a cylinder 42. In addition, a required number of paper bundle guide rollers 43 are positioned on the push-out side of the basket which as foresaid is equipped with the plate 41. The operation of the stacker described above is entirely controlled by the stacker control 25 through the directions issued by the above-mentioned direction circuit 13. It will be apparent from the foregoing description that the operation of the stop 23 is controlled by the stacker control through the direction circuit 25 and that the operation of the opening-closing plate 26 is also effected by the same control 25 through a cylinder 32. The rotation of the basket through said hydraulic system 35 is effected in correspondence with the functioning of the opening-closing plate 26. As described above, the number of folded paper copies travelling on the conveying mechanism 1 is at all times detected by the detector 3, while the information from the copy control program is detected and transferred to the memory circuit and direction circuit 13. These latter pre-set values are compared with the values detected by the above-mentioned detector 3, whereby the delivery of the folded paper on the conveying mechanism is controlled. When the required number of copies of the newspaper (one batch) corresponding to one of the numbers of copies which are

one of the sorting items programmed are placed on the opening-closing plate 26, the two halves 28 and 29 of the plate 26 move in the opposite directions to open the plate 26, whereupon the newspaper batch falls into the basket 34. Then, the basket 34 turns by 180 degrees while containing the same batch. At this moment, the two halves 28 and 29 remain closed. When the above turning is completed, another newspaper batch will have been placed on the opening-closing plate 26. Now, as the opening-closing plate is caused to open, this second batch falls into the basket. Thus, the batches are stacked up in the basket in such a manner that the back of the folded paper in the second batch overlaps the open edges of the uppermost paper in the first batch. In this manner, a series of newspaper batches is stacked up within the basket in successively opposite directions as the basket turns by 180 degrees between any two batches. When the batches within the basket has reached the required number of copies, the entire papers are pushed out from the basket by the pusher plate 41 in the form of a bundle.

In the stacker of this invention, since the conveying mechanism 1 consists of a flat conveyor which may be either mildly inclined or horizontal, the papers travelling from the printing machine to the stacker are partially overlapped and, therefore, are slightly inclined. Therefore, it is not necessary to change the positions of the papers on the conveyor, but the papers may be conveyed straightly. Thus, the newspapers will not be soiled or damaged as they would be if their positions were altered.

For the same reason, the number of copies of the papers may be easily and accurately detected on the conveyor (the conveying mechanism 1). Moreover, with the conveyor being so constructed and the papers being so conveyed as described above, the belt conveyor itself can be installed straight from the printing machine to the stacker so that not only the efficiency of conveyance but also the efficiency of copy detection may be enhanced.

Since, as aforesaid, the conveying system 1 does not require a complicated mechanism for changing the position of the paper being conveyed, but requires simply a system adapted to transfer the papers from the printing machine to the stacker, it attains the desired objective with a simple mechanical structure.

Stated differently, there is no fear of failure in the conveyance of the papers, and besides being easily handled, the conveying mechanism does not require any extraordinary labour in operation and maintenance.

The detector 3, which is a photoelectric cell system consisting of a projector and a light receiving element, detects the number of copies of the newspaper by the shadow formed between the leading edge of the paper and the preceding paper. In addition to the fact that the detection is carried out quickly and accurately by a simple mechanism, it is effected in the vicinity of the papers being conveyed, with the result that the detection is not hindered by the extraneous shadow or light rays, dust and other interfering factors. Furthermore, since the opening-closing plate 26 is opened or closed as the two halves 28 and 29 move in opposite directions and the relative functioning of the preliminary intercepting stop 23 and the stop 5 intermittently positions a paper batch on the opening-closing plate, the placing of a predetermined number of batches on the opening-closing plate is always effected easily, quickly and accurately. And the dropping of each batch into the basket 34 located under the opening-closing plate is also effected quickly and accurately. Furthermore, the opening-closing plate itself and the mechanism responsible for its operation may also be of simple construction.

Since the two halves 28, 29 of the above-mentioned opening-closing plate move a short distance in opposite directions, both the distance of the movement and the free space required for that movement may be considerably smaller that would be required if a moving fork system were employed. As the two halves of the plate move only a short distance, the movement of the halves and, accordingly, the opening and closing of the plate are performed quickly and responsively.

As for the formation of said newspaper batch, the predetermined paper in the flow of paper on the conveying mechanism 1 is pressed for a while from above by the preliminary intercepting stop 23 so as to make a free space of a predetermined dimension in the flow. This space is formed between the preceding flow of paper and the succeeding flow of paper, and the stop 5 serves to stem the above-mentioned succeeding flow of paper in this space. The preceding flow of paper reaches the opening-closing plate 26, on which it is made into a batch. The intercepting stop motion described above is actuated according to the above-mentioned programmed control.

The bundle of newspaper corresponding to the number of copies to be dispatched is transferred from the stacker 21 to the packaging machine 74 through a transfer machine 44 such as a conveyor, said packaging machine 74 consisting of film stands 45, a packaging element equipped with a heat sealing mechanism and a control panel 47. The film stands 45, 45 are located on both sides of a first press 48, and the newspaper bundle placed on a sheet of film is forced down so that it is wrapped up in the film. The packaging element consists of the above-mentioned first press 48 equipped with top sealers 55 and 56 and a side-sealing second press 49. Thus, the films from the two film stands 45, 45 are

fused by the first press 48. By the press 48 the bundle of paper is forced down and the top-sealing of the film is effected on its upper surface. A roller conveyor 50, which belongs to this first press structure, opens laterally with respect to said newspaper bundle. The bottom portion of said first press structure is provided with a transfer belt conveyor 51, by which the bundle is sent into the second press structure 49, in which it is pressed. Flap-in means 52 and 53 are shown on both sides of the bundle. A top film suction means 54 is provided for the film wrapping the newspaper bundle. The second press 49 is provided with the conveyor 57 which is intermittently driven. The various components described above are driven by the respective cylinders 58. The shrinkage tunnel 46 is located behind the second press structure 49, consisting of a hot wind tunnel 59 and a cold wind tunnel 60. Air curtains are provided at the inlet and exits of said hot wind tunnel. The newspaper bundle packaged by the above packaging machine 74 in the conventional manner is tied up by a tying machine of the conventional type.

The above procedure completes a ready-to-ship newspaper bundle. This bundle is then transferred to a newspaper shipping department by means of a delivery mechanism 20. The newspaper bundle packaged and tied as above is given a visual identification mark based on the program control hereinbefore explained. Thus, in case a transparent packaging paper or film is used, the card 7 placed on the uppermost sheet in the bundle serves the identification purpose. When the packaging paper is opaque or it is otherwise undesirable to insert the card into the package, a sorting sheet is pasted onto the package by means of a pasting machine 18 after said packaging and tying operations.

Each newspaper bundle has had to be sorted according to the various sorting data such as the destination, the number of copies, whether the bundle is to be shipped by train or truck, and others, and must now be transferred to one of shipping terminals 61 at the end of the delivery conveyor. The bundle is then loaded at this terminal 61 into a truck or other vehicle parked alongside said terminal. The accurate and quick shipment of the newspaper will be affected if the loading operation is improperly conducted; for example, if the bundle destined for B course is mistakenly loaded into a truck headed for A course. Through those operations, the bundle containing the programmed number of copies of the newspaper out for a given destination is shipped out based on the information controlled by the above-mentioned memory, direction, and control circuits in perfect conformity with the program which contains such information items as the description, the number of copies, whether the bundle is to be sold on the newsstand or delivered to the subscribers, and whether the bundle is to be shipped by truck or train.

Before proceeding to a detailed description of the sorting and delivery system in the shipping department, the electrical system to be used in the method and apparatus of this invention will be explained by reference to the block diagram shown in Fig. 14. Referring to Fig. 14, a punch card, printed card, perforated tape, or magnetic tape is fed to a card read-out system or computer 10, by which the programmed information containing the destination and number of copies to be dispatched is converted to an electric signal which is fed to the memory circuit 12. This electric signal, which contains a total number signal, a batch signal and a bundle signal, is fed to memory elements F3, F4 and F5 through gate circuits G3, G4, and G5 respectively. The gates of said gate circuits G3, G4 and G5 are opened as they receive a count up signal from a counting circuit 62. The detection signal obtained as to the number of copies being conveyed on the conveying mechanism 1 is fed to a binary counting circuit D3 in the stacker control 25. A number-of-copies setting system 63 is previously supplied with a digital signal representing the desired number of copies, and when the detected value agrees with the above-mentioned digital signal value, the setting system 63 transmits an output signal. The output signal resets the above-mentioned binary counting circuit D3 so that the latter may be ready for receiving the next detected signal. At the same time, the output signal is amplified by an amplifier 64 and is fed to the preliminary intercepting stop 23 on the conveying mechanism 1 and, also, to another binary counting circuit D4 at a subsequent stage. On the other hand, when the batch signal, or a signal setting the desired size of the batch, which has been fed to the batch size setting section 15, agrees with the batch size value counted by the binary counting circuit D4, the batch size setting section 15 transmits an output signal, by which the above-mentioned binary counting circuit D4 is reset. The same output signal, after being amplified by an amplifier 65, is fed to a newspaper bundle push-out system 66 in the stacker. At the same time, the output signal is fed to a binary counting circuit D5 at the subsequent stage, whereby the number of batches contained in the stacker basket is counted. The number of bundles so counted is then compared with the set value at the bundle size setting section 16, that is, with the set bundle signal recorded on the card or tape and when the two values agree with each other, the above-mentioned bundle size setting section 16 transmits a signal. At this moment, the stacker basket contains the number of newspaper batches corresponding to the bundle which contains the

required number of copies to be dispatched. The above signal resets the binary counting signal D5 and also the above-mentioned memory elements F3, F4 and F5 and counting circuit 62 so that they may be ready for the next series of operations. On the other hand, a sorting and delivery signal (a signal going to the delivery system 20) and an address signal (a signal going to the address printing machine 17) are fed to memory elements F1 and F2 in the memory circuit 12 through gate circuits G1 and G2. The gates of said gate circuits G1 and G2 are opened by a count up signal from the above-mentioned counting circuit 62. In the first place, the sorting and delivery signal is fed to the address printing machine 17 through a relay Ry 1, and the printing machine produces a sorting sheet carrying the address to which the newspaper should be shipped. Then the machine 17 transmits a signal to the sorting sheet pasting machine 18 in the subsequent stage, while resetting the above-mentioned memory element F1 at the same time. The pasting machine 18 pastes the sorting sheet onto the upper surface of the package prepared by packing and tying the bundle from the basket 34 by means of said packing machine 13 and tying machine 74. On the other hand, the sorting and delivery signal is fed to a gate control circuit 68 in a delivery control 67 for the sorting and delivery section 20 through a relay Ry2. The above-mentioned control 67 is so designed that when the signal transmitted on actuation of the limiting switch Ls for the bundle delivery system 69 in the delivery section 20 agrees with the sorting and delivery signal, the bundle 19 delivered out of said packaging machine is memorized by a sequential memory circuit 70 shown in Fig. 12. The output signal of said sequential memory circuit 70 is fed to a delivery means 73 adapted to deliver the bundle to an apportioning means located at the shipping junction 61 through a conveyor control circuit 71 and a shipping control circuit 72. In Fig. 14, Ry3, Ry4 and Ry5 represent relays. The direction from the above-mentioned direction circuit 13 is given to the stacker 21, which accordingly sends out a bundle containing the required number of copies as per the program. If there are a packaging machine 74 and a tying machine after the stacker 21, the newspaper bundle emerging from said packaging and tying machines will bear a visual identification card or sheet carrying the destination and other information items corresponding to the directions issued by the above-mentioned direction circuit 13. Thus, when the direction signal from the direction circuit 13 agrees with the signal issued on activation of the limiting switch Ls on the delivery section 20, it is memorized by a sequential memory circuit 70 within the control 67 of the delivery section 20. When a computer master control system is employed in which the stacker 21, the packaging machine 74 and tying machine are arranged in parallel as A′, B′ and C′ and synchronistically perform controls according to the program, a signal is fed to the sequention memory circuit 70 when the direction from the computer agrees with the direction from the limiting switch Ls.

In the conveying section, the packaged and tied bundles 19 which carry different sorting items A, B and C according to the above-mentioned program are delivered on the same conveyor. The delivery section 20 has a sufficient width to carry a single bundle 19. Instead of providing for a width sufficient to accomodate two or more rows of bundles, there are provided waiting points or means in the bundle delivery section 69 so that a bundle may cut into the flow without collision. The memory circuit memorizes the sequence of bundles on the delivery section 20 according to their destinations and the required sorting is carried out in such a manner that the bundle reaching the point where the delivery section 20 meets the shipping junctions 61 is sent into the shipping junction 61 corresponding to the programmed information through delivery means 73.

Assuming, now, that bundles A, B, and C from A′, B′ and C′ are delivered to different shipping junctions 61, 61 and 61, a single sequential memory is not expected to perform properly, for the bundles must change their order in the waiting point before they are sent into the proper shipping junctions. For that reason, the sequential memory circuit 70 is provided in plurality, that is to say, such a memory circuit is provided for every change in the order of bundles so that the changes in previous memory due to the cutting-in or sending-in of a particular bundle may be rememorized. Thus, sequential memory circuits 70, 70 and 70 are provided at three sections x, y and z.

In Fig. 10 which shows the memory pattern of the destination sequence for each section, O denotes the memorized state. The memory circuit is so constructed that the sorting items are taken lengthwise and the maximum number of bundles 19 which can be carried on the delivery section 20 per said section is taken crosswise to form a matrix circuit. The sorting items are A and B in two rows, and the maximum number of bundles on the delivery section is 4. Selection of the fill-in lines is carried out by means of a ring counter having the same number of electron circuits as that of said lines. The ring counter 75 actuates only one element, with the other elements in reset position, and whenever there is an input, the action moves to the superior element and the element which has been actuated returns to the reset position. With the ring counter 75 being thus arranged

in correspondence with the number of memory circuits, the gate of the memory circuit in the line for which the ring counter is in actuated state is opened. For reading-out, a similar ring counter 76 is provided for the selection of read-out positions. Now, the memory function of the x section will be explained in some detail. When there is no bundle 19 on the x section, the position of the ring counter lies in the first line for both fill-in and read-out. Thus, the memory circuit $\alpha 1$ and $\beta 1$, in the first line remain ready to memorize. When a bundle 19 destined for A′ actuates a limit switch Ls 1 and enters the x section, the memory circuit $\alpha 1$ assumes a memorized state. At the same time, the signal from the limit switch Ls 1 through a logical sum circuit OR1 actuates a one shot multi-circuit M1, feeding a pulse signal of a given minute time amplitude to the fill-in ring counter 75. The output of said logical sum circuit OR1 is not made a direct input to the ring counter because since the memory circuit is actuated by the same operation signal of the Ls 1, the same time is not desirable. Therefore, it is so designed that the movement of the fill-in position is effected only after the allowance of time required for the operation of the memory circuit. After the memory in the first line is completed, the ring counter is in the W^2 position and the memory circuits $\alpha 2$ and $\beta 2$ in the second line become ready to memorize.

Assuming that a second bundle 19 is B, a limit switch Ls 2 functions to put memory circuit B2 in memorized state. If the bundle 19 is A, the memory circuit actuates $\alpha 2$ to put it in memorized state. In this manner, the memory circuits α or β is caused to memorize the fact that there has been an input. Then, as the delivery section moves, a bundle 19 enters the Y section. Since a new bundle cuts in from C′ on the Y section, a fresh sequential memory is carried out by a sequential memory circuit 70 which contains the new sorting item C′.

As shown in Fig. 13, the memory circuitry for the Y section has an additional α memory circuit due to the addition of the junction 61. The bundle C can be identified from the operation of Ls 4, but the bundle moving from the X section to the Y section may be either A or B, this differentiation cannot be obtained merely from the operation of Ls 3. Therefore, every time the Ls 3 is actuated, by following the sequence of memories in the sequential memory circuits for the X section, that is, by moving the read-out ring counter 75, the memorized information is allowed to be re-memorized by the circuits in corresponding lines for the Y section. However, the signal that advances the read-out position is not obtained from Ls 3, but obtained from the read-out signal of a shift register XN. This is because if the read-out is obtained from the operation of Ls 3, the bundle which could be removed because of collapsing or other incidents may not be accountered for properly. In such instances, errors in read-out will result if the sequence memorized by the memory circuits is faithfully followed. To prevent such errors for taking place, the above-mentioned shift register is employed. A shift register memory circuit is provided in each section, and the length of the delivery section 20 conveyor corresponding to that section is represented by a series of shift registers. Thus, a unit length of the delivery section conveyor is represented by a single shift register and the resulting simulated conveyor 77 is formed into a logical sum circuit. In this manner, as the bundle enters this particular section, the first shift register memorizes the input. As the conveyor moves beyond the length covered by the single shift register, the memory is stopped down to the second shift register. Thus, the memory travels from one register to another in correspondence with the movement of the conveyor. The simulated conveyor L1 has one shift register every unit length "1" and the fill-in position and the read-out position are shown at XM 1 and XM, respectively (See Fig. 11). A limit switch Ls a is adapted to shift the memory carried by the shift registers. In the x section, the signal from Ls 1 or Ls 2 is memorized by a shift register at XM. When the bundle on the conveyor proceeds to the section-change point, the memory in the shift register circuit is carried by the last shift register. Thus, when a series of shift register is provided in correspondence with the conveyor length of each section, and if every input of the bundle is memorized without differentiating the shipping junction 61 and the memory is read out at the section-change point and carried by the particular shift register, the signal may be used to drive the read-out counter of the above-mentioned sequential memory circuit. Thus, the read-out position when no read-out takes place in the x section is in R1 line. When the memory of the shift register circuit has been transferred to the last shift register in accordance with the movement of the conveyor, said shift register supplies an output signal to the read-out position selector circuit, whereupon the read-out position is transferred from R1 to R2. This change signal resets the $\alpha 1$ and $\beta 1$ memory circuits in the first line. The one of the $\alpha 1$ and $\beta 1$ memory circuits which carries no sequential memory is in the reset state and, accordingly, will not be affected. However, the circuit carrying such a memory is reversed by the reset signal and, therefore, transmits a change signal. When $\alpha 1$ is in memorized state, as the bundle on the conveyor reaches the final point of the X section, the memory in $\alpha 1$ of the sequential memory circuitry is read out by the memory

signal from the shift register on the simulated conveyor 77. If there is a bundle 19 on the actual conveyor, Ls 3 is actuated to open the gate of the logical sum circuit, whereby the memorized information is transferred to the sequential memory circuitry for the y section. Should it happen that when the memory in α or β is read out with the memory of the simulated conveyor 77 involving said shift registers, there is actually no bundle on the real conveyor, there will be no operation of Ls 3, with the result that the memory of the sequential memory circuitry will be cancelled out and not be transferred to the subsequent memory circuitry. This is the reason why no error in sequence read-out takes place even when there is an accident on the moving conveyor.

The sequential memorization and read-out for the y section may also be carried out in the same manner as above. Thus, a unit length 1 is set in each section with a shift register provided for each "1", and a fill-in limit switch Ls 1 or Ls 2 is made responsible for the fill-in position XM and a limit switch Ls a for shifting the shift registers is concerned with XM, while the read-out position is XM. Thus, at each cutting-in point 69, a shift register of said simulated conveyor 77 and a sequential memory circuit for that section may be provided. Then, when a bundle reaches the shipping junction 61, the read-out and sequential memorization are also effected in the same manner as at the cutting-in point, but when the information read out by the sequential memory circuit is to be such that the bundle be sent into the junction 61, the signal is not transferred to the subsequent sequential memory circuit, but the sending-in means 73 is actuated to send the bundle into the junction 61. Now, when the bundle travelling on the y section of the conveyor actuates Ls 5, a signal is transmitted at the final register in the shift register circuit for the y section. By means of said signal, the destination, that is, the junction 61, memorized by the y section is read out through a read-out position selector circuit. If the read-out signal is A, the sequential memory circuit for the x section will not be actuated, but the signal actuates the sending-in element 73 for the junction 61 for which the bundle is destined, whereby bundle A is sent into said junction 61. When the information read out is B or C, it is rememorized by the sequential memory circuit for the x section. Since the choice of shipping junction 61 is an alternative between B and C, there occurs no signal to be fed to the subsequent stage when the Ls 6 is actuated after the x section is passed through, and the information read out from the sequential memory circuit for the x section actuates the sending-in element 73 for the shipping junction 61 for which bundle B should be destined. In case the read-out information is C, there occurs no signal and the bundle C is allowed to travel automatically to the shipping junction 61 for which bundle C is destined. For the above-mentioned memory circuits, semi-conductor, electron tube, or relay circuits may be utilized, and if parametron is used, there will be no cancelling out of the memories in the event of current failure. A sequential memory circuit has been provided for every sorting item in the arrangement described and illustrated, but since a single memory element assumes two states, it is possible to obtain four different states by using two memory elements in combination. The number of memory circuits may then be reduced. While the bundle A enters its proper shipping junction 61, it may also be sent into any of the junctions 61, 61 and 61 by selecting the proper memory sequence with a changeover switch in the stacker 21, for instance. It will be apparent from the foregoing description that, according to this invention, the newspaper bundles may be easily, quickly and accurately delivered into several shipping junctions 61, 61 and 61. Alongside each of said junctions 61, a truck or other vehicle may be parked. Thus since the newspaper bundles loaded into such a truck or vehicle carry the proper sorting cards or sheets, they may be unloaded and delivered to the stations, distributor's premises, and other points on the way easily, quickly and accurately according to the information provided by said cards or sheets.

Since the shipment of newspaper bundles containing the predetermined numbers of copies to various destinations is made possible by a single programming even when the newspaper is not a single edition but consists of different editions (such as when there are local editions) and because such programmed information is also embodied in the sorting cards or sheets to be attached to the corresponding bundles, the newspaper bundles may be easily, quickly and accurately delivered to different destination even if the contents of the bundles vary with said destiations. An advantageous feature of the invention is that even if the destinations, the number of copies to be shipped to a particular destination, the course of shipment and other delivery sorting items are changed frequently, the shipment of newspaper may be effected as easily, quickly and accurately by merely changing the content of the program. Furthermore, the invention not only provides means for automatically carrying out the sorting and conveyance of the newspaper from the printing machine to the shipping department, but also provides means for carrying out the same by a central programmed control. Thus, for example, when a computer system is employed, the above operation may be entirely carried out by means of a single computer. Even when a card system is adapted, one route

from the printing machine to the sorting and shipping department may be taken care of by a single control system.

Although the above described embodiments refer to newspapers, clearly other printed material could be controlled.

WHAT WE CLAIM IS:—

1. A process for automatic control of newspaper and other printed matter characterized by constantly detecting the number of copies of the newspaper or other printed matter being continuously fed out from a rotary or other printing machine by way of the shadow or difference in darkness formed between the folded edge of each sheet of said newspaper or other printer matter and the leading edge of the immediately preceding sheet, guiding the sheets in a continuous flow on a single plane which may be either horizontally or mildly inclined, said sheets remaining in the same partially overlapped position as they are initially placed on said plane, causing memory means to memorize a programmed control information containing such sorting data as the destinations and number of copies of the newspaper or other printed matter to be shipped and other information, feeding the memorized information to direction means controlling the values detected as above of the newspaper or other printed matter by control means based on the directions provided by said direction means, interrupting the flow of said sheets based on said control so as to make bundles of said newspaper or other printed matter, controlling the sorting and delivery operations of a sorting and delivery carrying system by means of said control means, thereby allowing each of the bundles to select a predetermined one of the shipping junctions provided on said delivery carrier system, and loading the bundles from said shipping junctions into trucks or other vehicles parked alongside said junctions, each of said trucks or other vehicles being destined to carry the bundles sorted out as above.

2. A process for automatically controlling newspaper or other printed matter as claimed in Claim 1, wherein said bundles of newspaper or other printed matter, immediately after forming, are packaged and tied, and the cards or sheets carrying the sorting data for the particular bundles, such as destinations, shipping courses and the like, are passed onto the respective packaged and tied bundles, said bundles carrying said cards or sheets being placed on said delivery carrier system so that said cards or sheets may be utilized in the identification of the bundles when the latter are loaded into trucks or other vehicles and also when the same are unloaded at destinations.

3. A process for automatically controlling newspapers and other printed matter as claimed in Claim 1, characterized by reading out printed card, punch card or similar means containing said sorting data for programmed control, memorizing the information read out as above, comparing the control signal obtained from direction means through control means with the integrated sum of said detected values, sorting the flow of sheets when the two values agree with each other, and after such control as above is completed, affixing each of said cards to the uppermost surface of the corresponding bundle of newspaper or other printed matter sorted out as above, so as to make said cards available for indicating clearly the destinations and courses of shipment of said bundles.

4. An automatic control system for newspaper and other printed matter as claimed in Claim 1, characterized by reading out and memorizing the information carried by a perforated or other tape containing said sorting information items, sorting the flow of printed matter by direction means through control means, thereby forming bundles of said printed matter, preparing sorting sheets or labels carrying the same information as that carried by said tape by means of a printing machine, and affixing the said sheets or labels on the corresponding bundles.

5. An automatic control system for newspaper and other printed matter as claimed in Claim 1, characterized by supplying a magnetic or other similar tape with an integrated control program and using a master control system in which the directions from said tape are distributed to various delivery routes leading from the printing machine to sorting and delivery sections.

6. An automatic control system for newspaper and other printed matter as claimed in Claim 1, characterized by intercepting the flow of printed matter being delivered on a plane by said direction and control means by pressing the flow for a short while so as to create a gap or free space in said flow between a preceding portion of said flow and a succeeding one, causing stop means to stop the succeeding portion of the flow to allow the preceding portion only to form a batch, and after said batch is properly stacked up, making a bundle of the printed matter from several such batches, all according to a program, by said direction and control means.

7. An automatic control system for newspaper and other printed matter as claimed in Claim 1, characterized by placing a batch of printed matter on an inclined surface, dividing said surface in two on the initial plane to cause the batch to fall, whereby said batch is tidily stacked up, said division of the surface being effected by moving two halves of said surface a short distance in mutually opposite directions on said same initial plane, and placing another batch of printed matter on said surface to repeat the procedure described above.

8. An automatic control system for newspaper and other printed matter as claimed in Claim 1, characterized by memorizing bundles of printed matter being delivered on a sorting and delivery route by means of sequential memory circuitry and whenever a change occurs in the sequential arrangement of said bundles forming a simulated conveyor with a shift register circuit corresponding to the conveyor length of that route, causing said circuit to memorize the positions of said bundles of printed matter travelling on said route, and automatically sending the bundles selectively into the proper shipping junctions along said route through the aid of said sequential memory circuit and simulated conveyor shift register circuit.

9. An automatic control system for newspaper and other printed matter as claimed in Claim 1, characterized by installing a delivery system which comprises a horizontal or inclined conveyor adapted to convey newspaper or other printed matter between a printing machine and a stacker providing said delivery system with detector means of the photoelectric cell type, said detector means being adapted to detect the number of copies of said newspaper or printed matter being conveyed, installing stop means adapted to stem a predetermined portion of said flow of sheets between said detector means and a preliminary intercepting stop adapted to intercept said flow, providing a constant speed section at one end of said delivery system, said section being adapted to convey the flow of sheets at a constant speed, installing an opening-closing plate platform in connection with said constant speed section, said platform being adapted to carry thereon a portion of said flow to be stacked up in the form of a batch and consisting of two halves capable of sliding on an inclined plane, said halves moving a short distance in mutually opposite directions, when opening, on said same plane, installing a basket capable of being rotated said basket being adapted to receive the batches falling from said platform, installing a pusher mechanism in connection with said basket, said mechanism being adapted to push the batches out from said basket, installing a memory means, such as a card read-out system, which is adapted to memorize the programmed information, installing direction and control means in cooperative relation with said memory means, connecting said control means with said stop and other means, installing packaging and tying machines in connection with said stacker, connecting sorting and delivery means with said packaging and tying machines, connecting said control means with said sorting and delivery means, and providing said sorting and delivery means with shipping junctions which may be directly connected to trucks and other vehicles.

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Agents for the Applicants.

rinted for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1968.
ublished by the Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

Fig. 1.

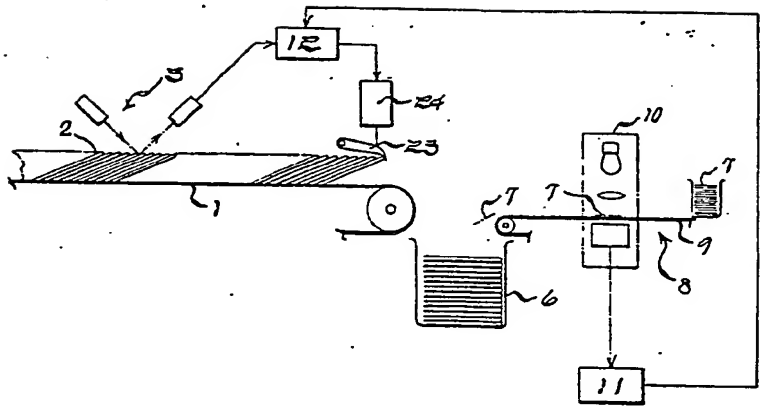
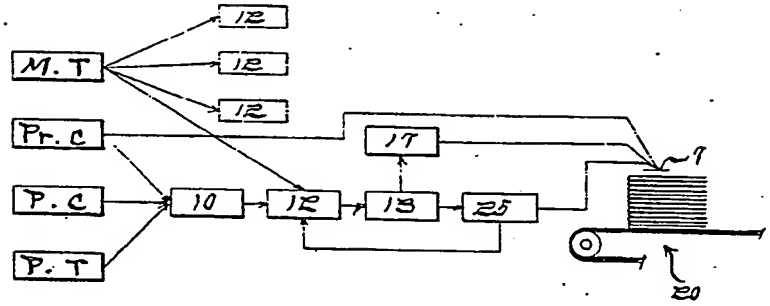


Fig. 2.



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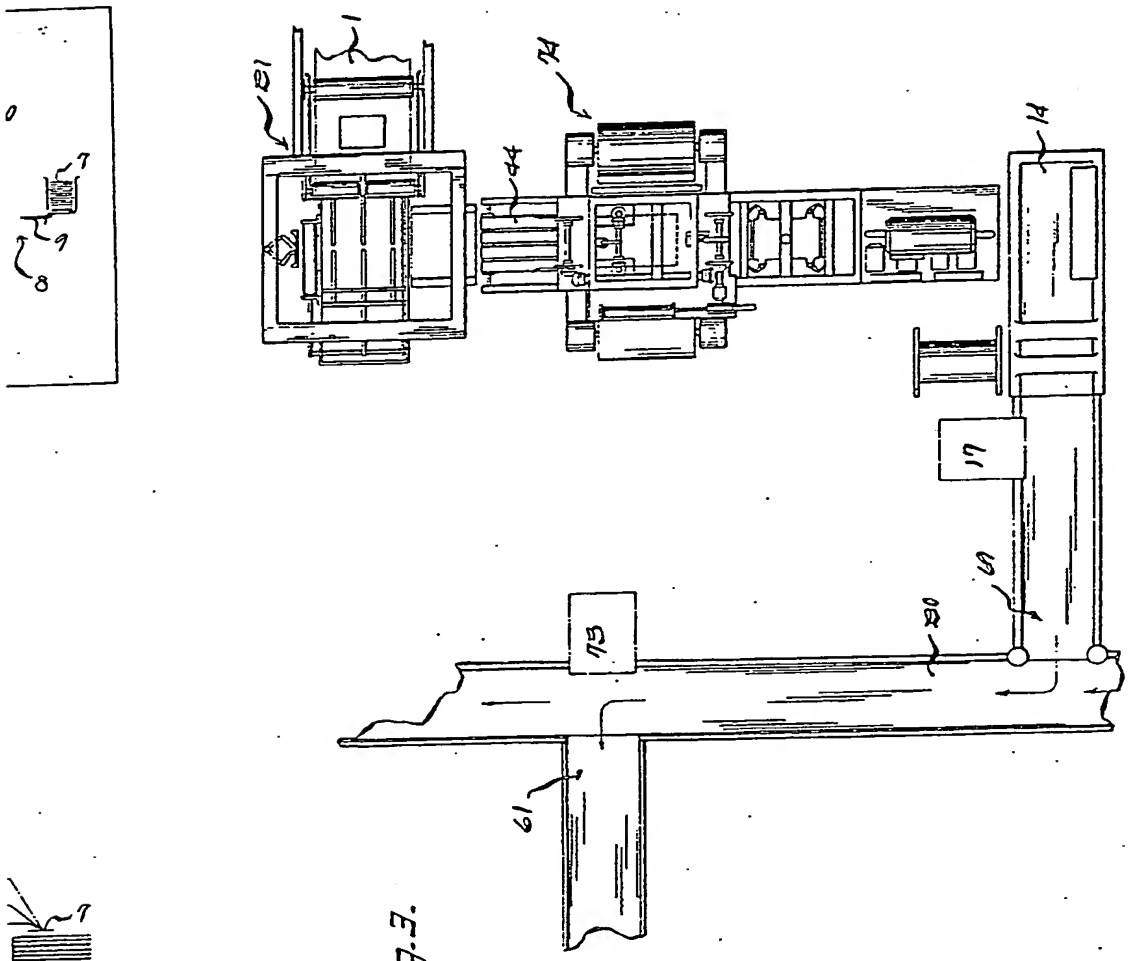

Fig. 3.

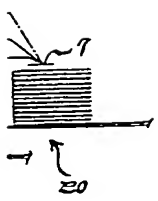

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Fig. 1.

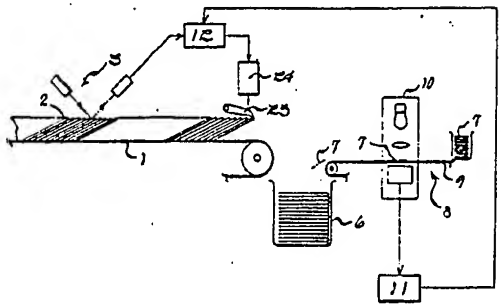
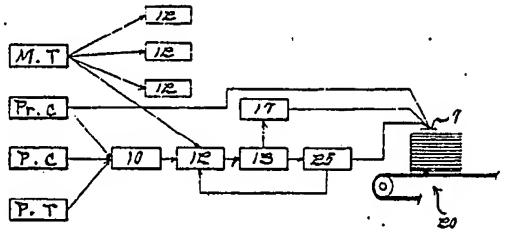


Fig. 2.



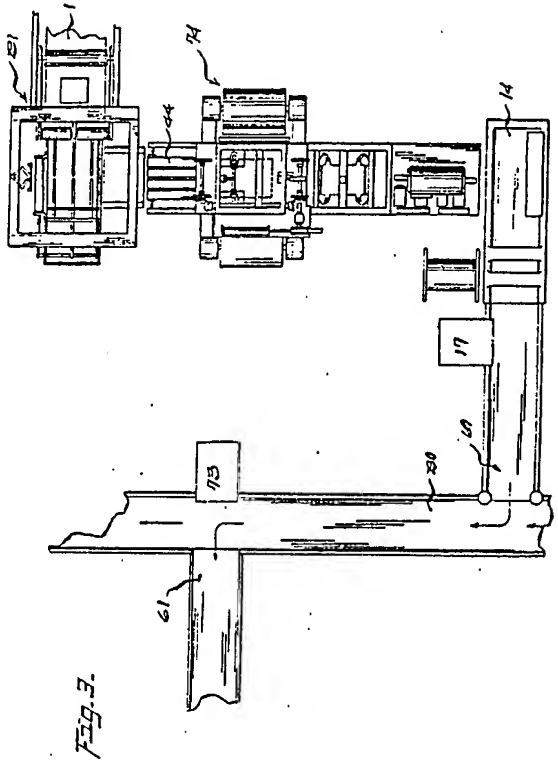


Fig. 3.

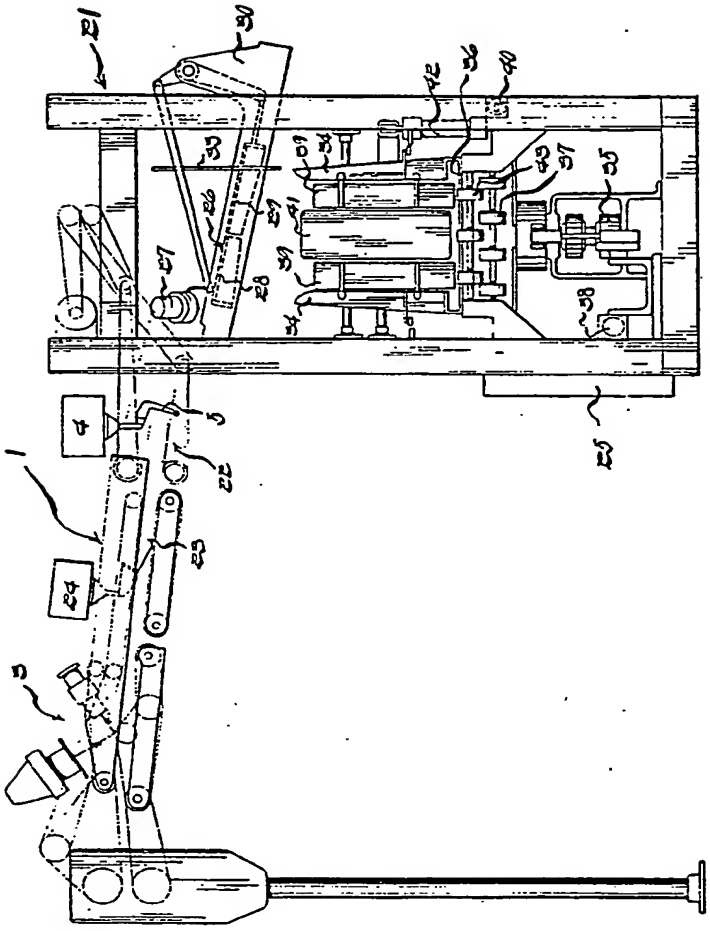


Fig. 4.

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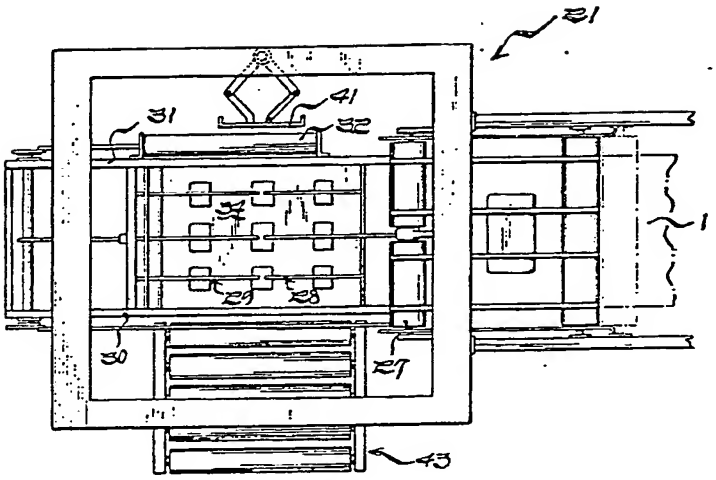
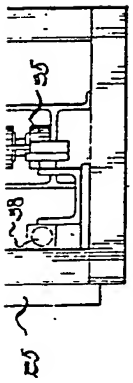
Fig. 5.





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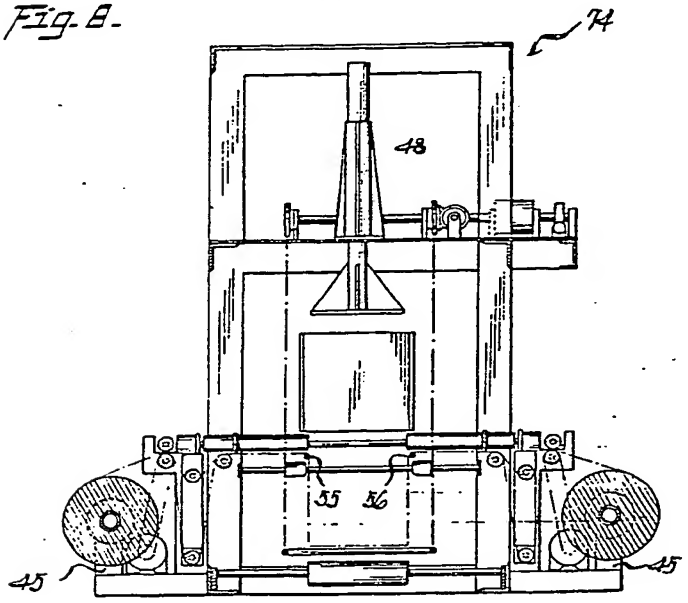

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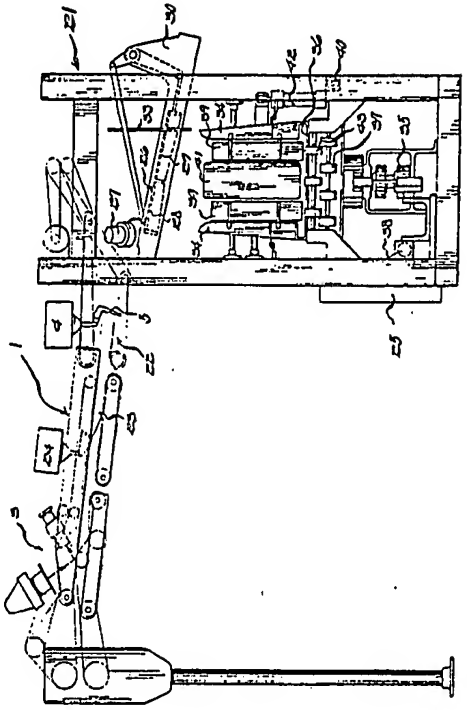


Fig. 4.

Fig. 5.

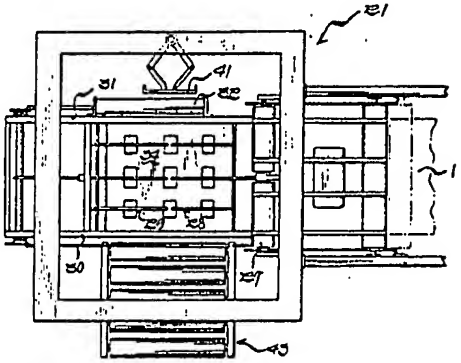
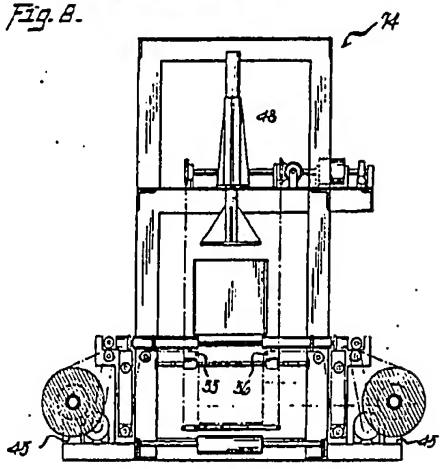


Fig. 8.



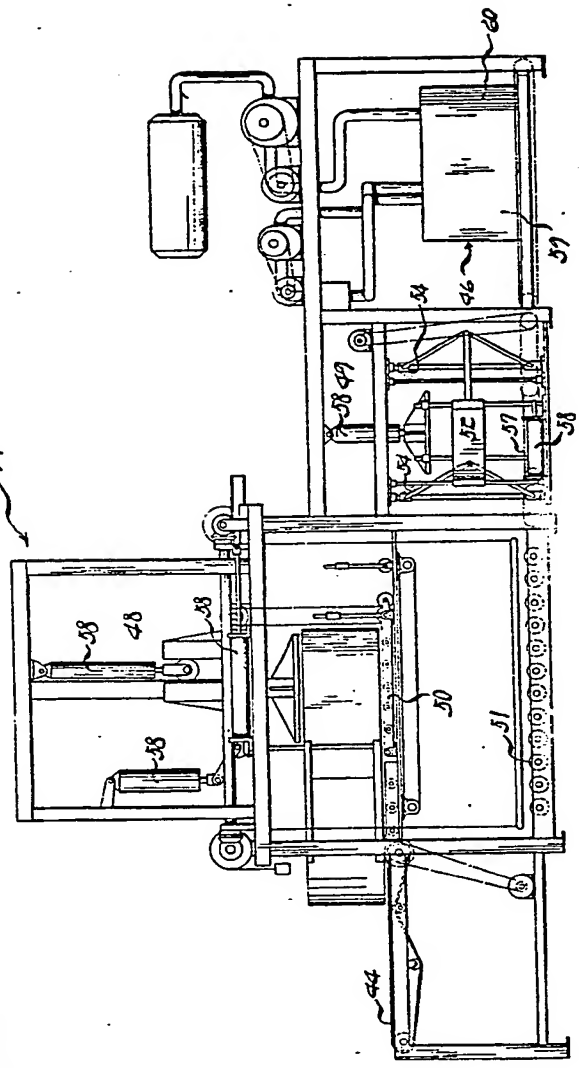


Fig. 6.

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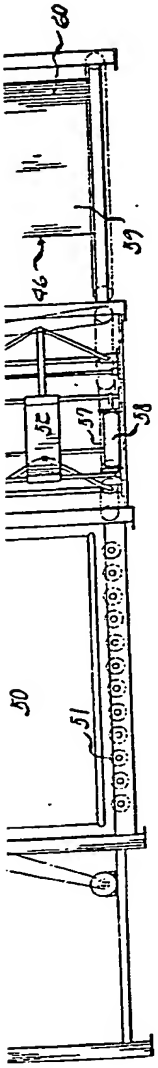

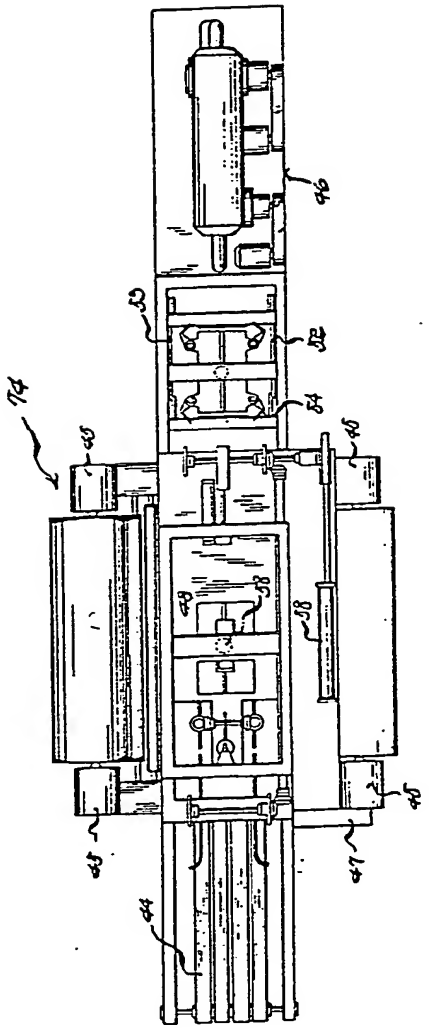

FIG. 7.

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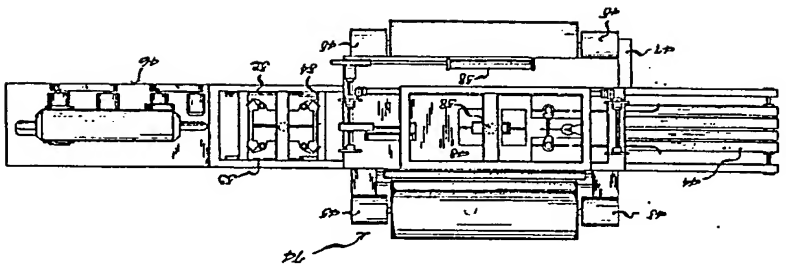


FIG. 7

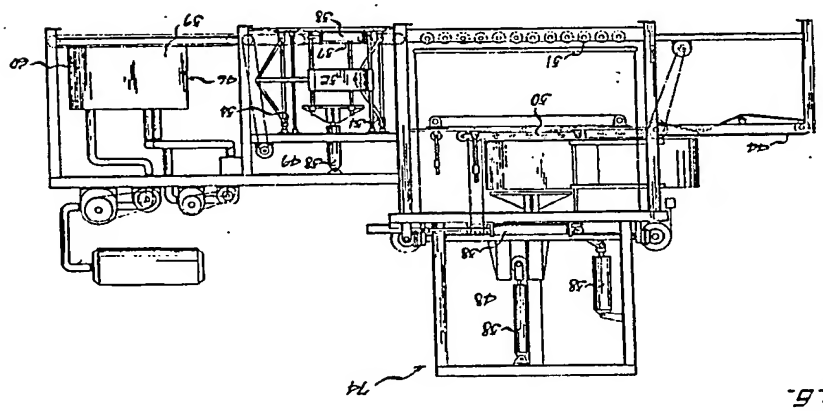


FIG. 6

Fig. 9.

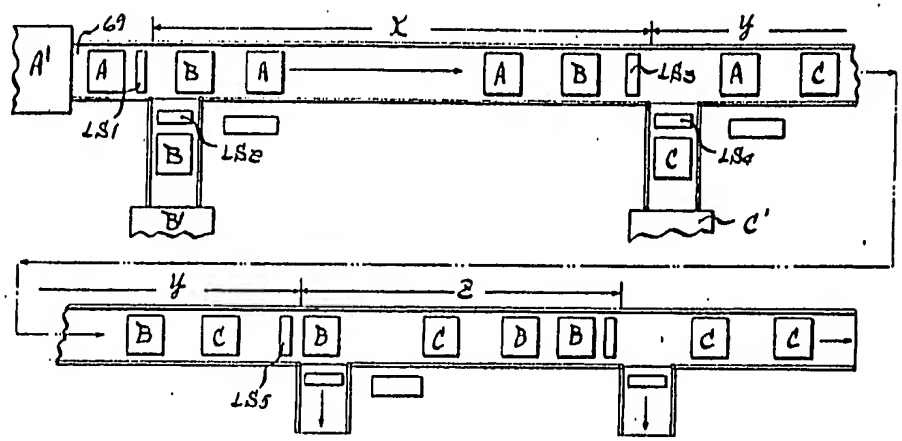


Fig. 10.

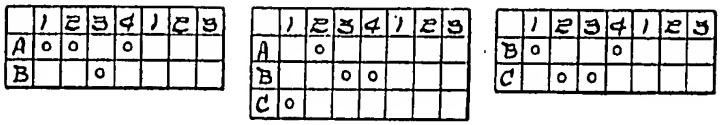
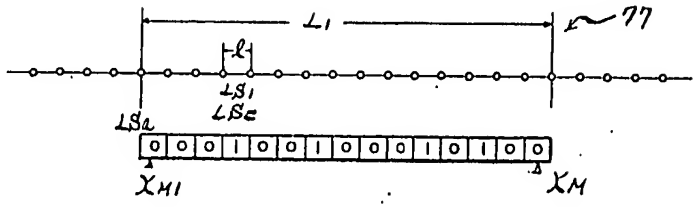


Fig. 11.



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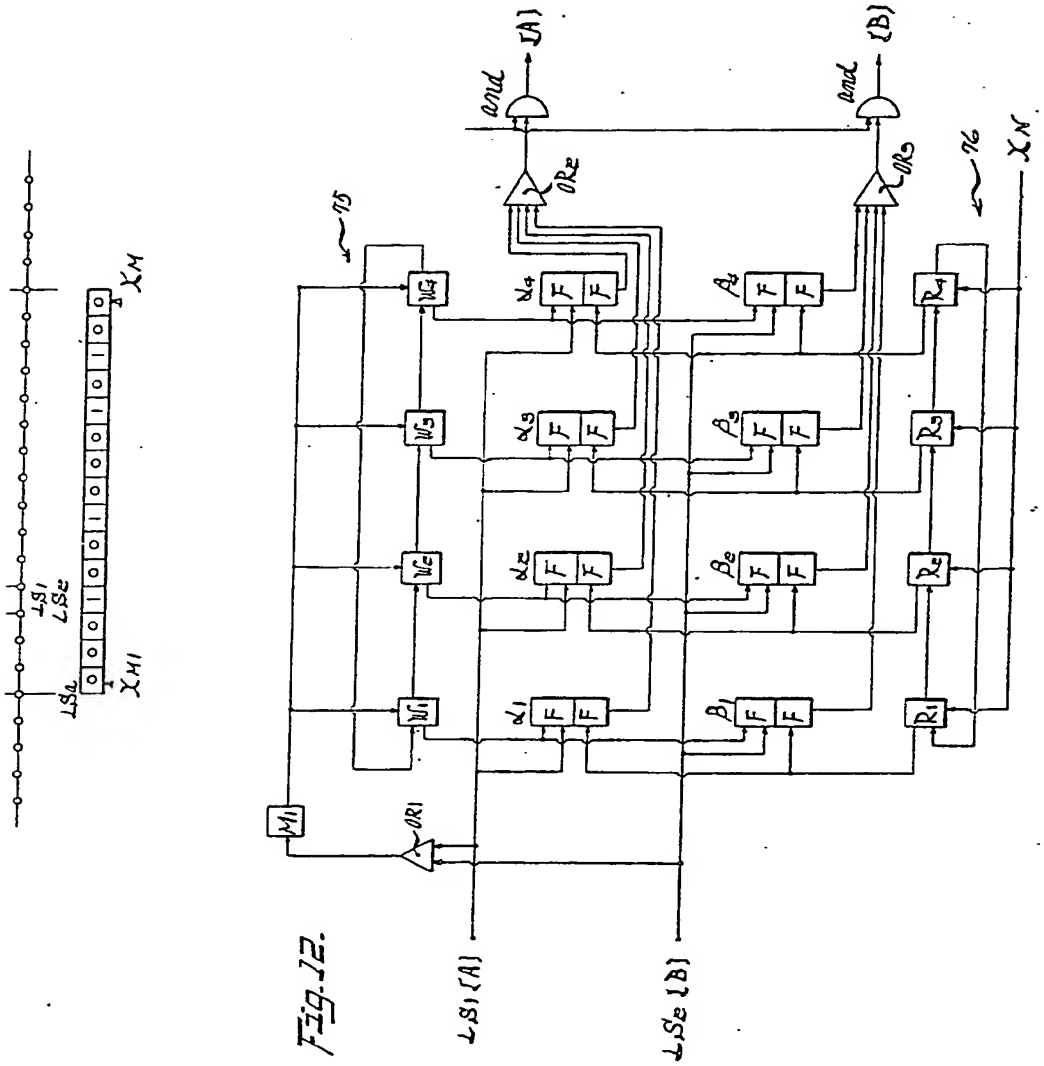
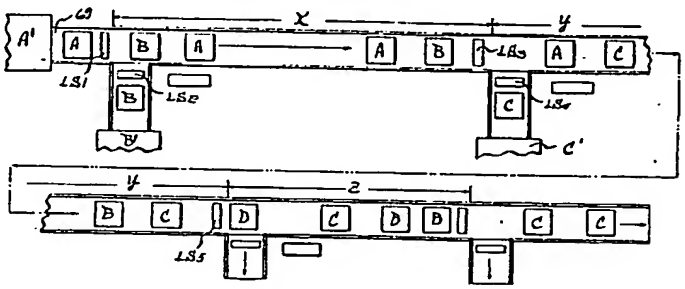


Fig. 12.

Fig. 9.



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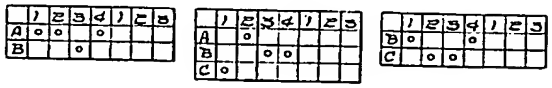

Fig. 11.

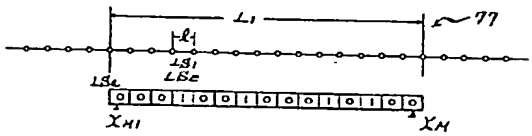

Fig. 12.

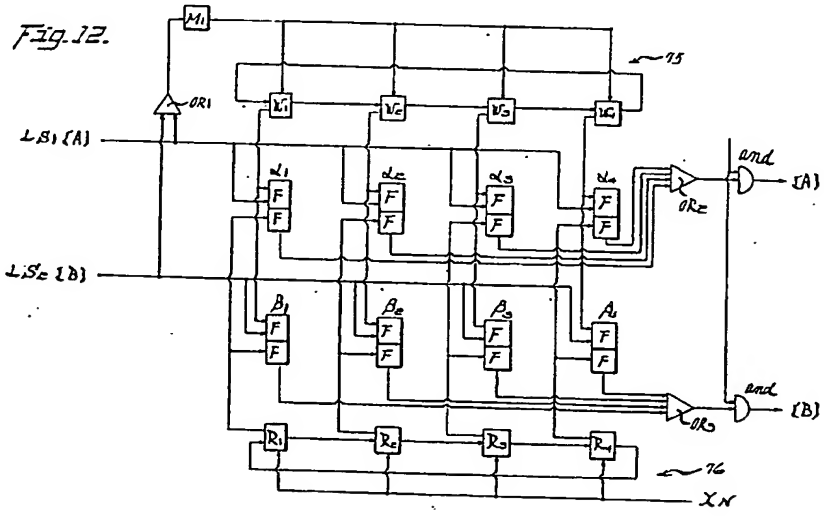

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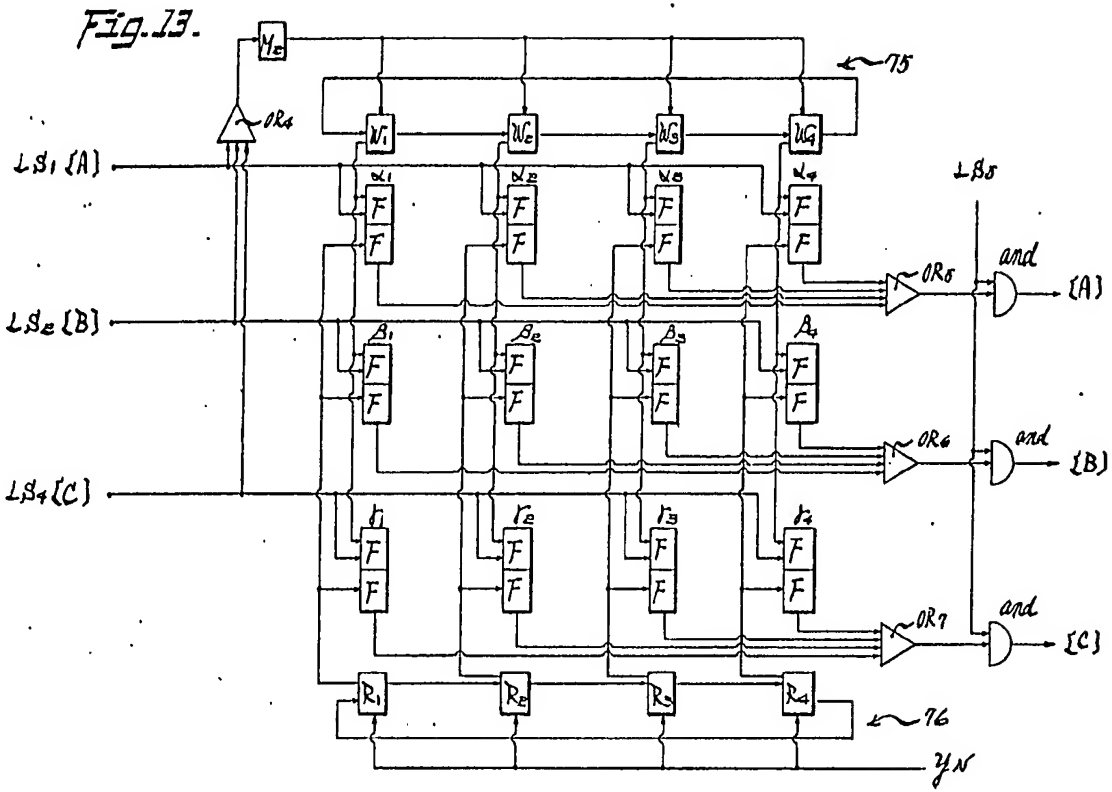
Fig. 13.



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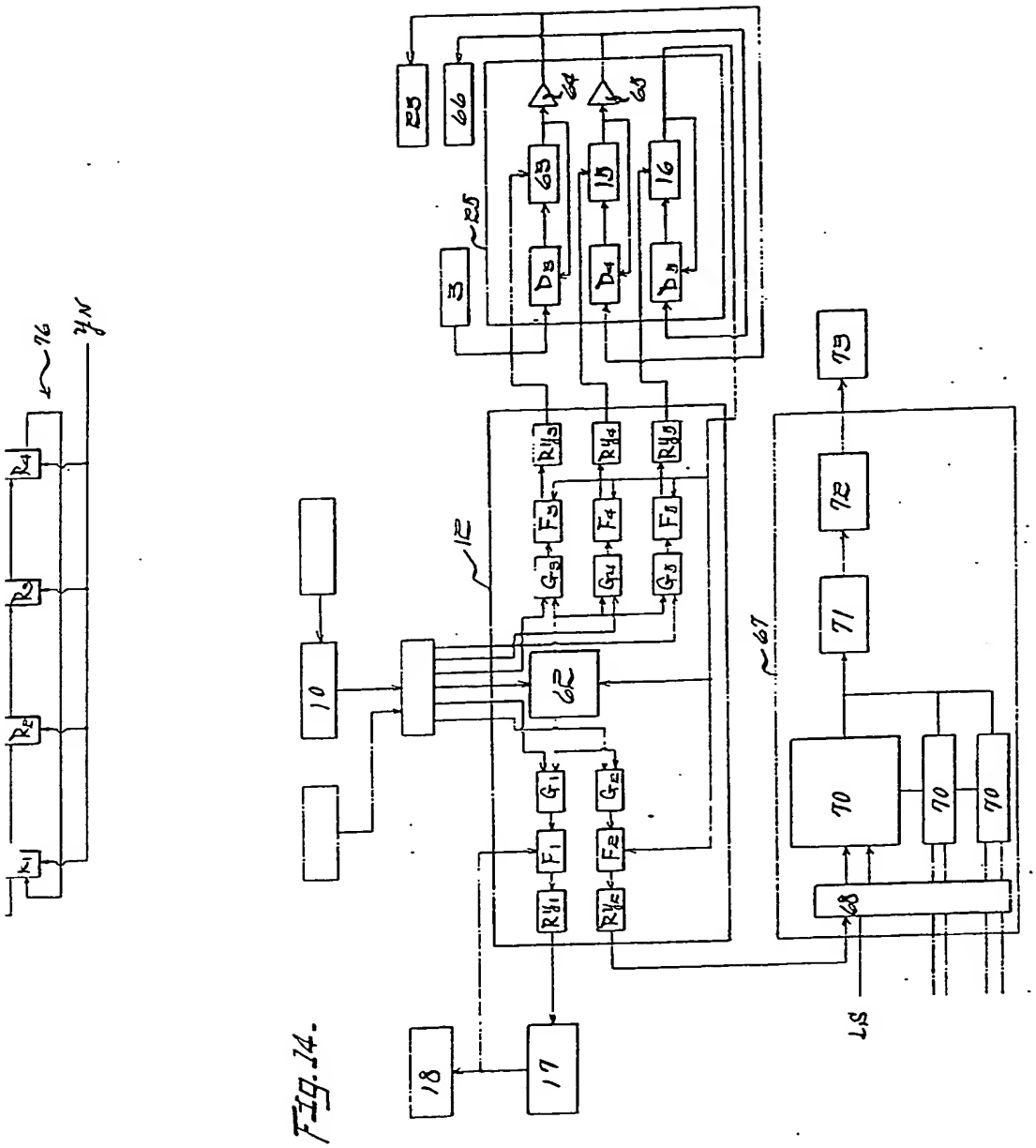

FIG. 14.

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10 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 9 & 10

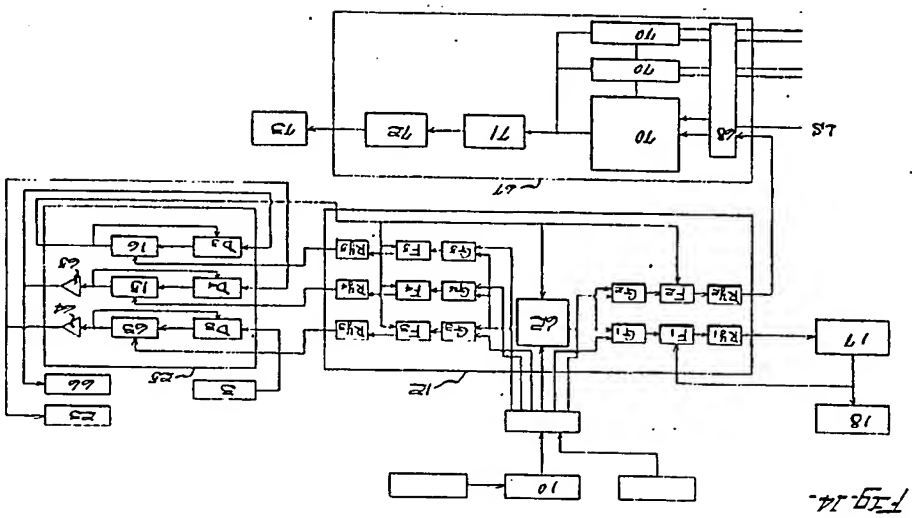

Fig. 14.

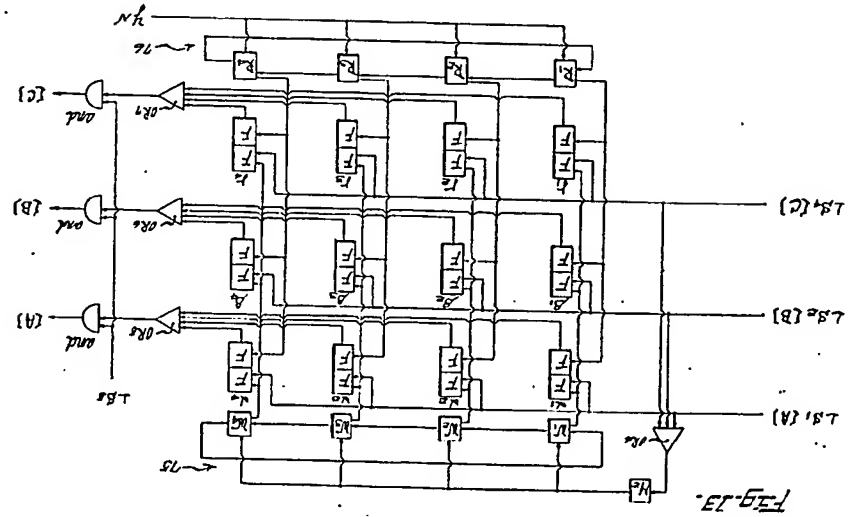

Fig. 13.